REMARKS

The Final Office Action dated January 21, 2010 has been carefully considered. Claims 2, 13 and 23-101 were canceled. Claims 1, 3-12 and 14-22 were amended. Support for the claim amendments may be found in paragraphs 148-154 of the Specification. Claims 1, 3-12 and 14-22 will be pending in the present application upon entry of the above amendments.

The foregoing amendment and the following remarks are being submitted as a full and complete response to the Office Action. Authorization is granted to charge counsel's Deposit Account No. 01-2300, referencing Attorney Docket No. 030687-00566, for any additional fees necessary for entry of this Response. Reconsideration of this application is requested.

Claim Rejections under 35 U.S.C. § 112

In the Office Action, claims 1-22 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with written description requirement because claim term "percentage" was not used in the specification. As indicated above, independent claims 1 and 22 were amended to recite a "highest density of uncleaned cells" instead of a "highest percentage of non-traveled cells". Support for these amendments may be found in paragraphs 130, 157 and 160 of the Specification. Accordingly, withdrawal of the Section 112 rejections is respectfully requested.

Claim Rejections under 35 U.S.C. § 103

In the Office Action, claims 1, 4-10, 12 and 15-21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Hulden (Int. App Pub. WO02/075470) in view of Adler (US Pat. No. 7,085,624). Claims 2, 11, 13 and 22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Hulden in view of Adler and further in view of Kurtzberg (US Pat. No. 6,167,332). Claims 3 and 14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over

Hulden in view of Adler and Kurtzberg and further in view of Okumura (US Pat. No. 4,674,048). Applicants respectfully traverse these rejections and request reconsideration.

In particular, independent claims 1 and 12 were amended to recite a robot cleaner that generates an internal map of an area comprising a plurality of subgrids, each subgrid comprising a plurality of cells; generates a subgrid map for each subgrid of the internal map, wherein the subgrid map has a higher resolution than resolution of the internal map; travels on a surface along a travel path from one subgrid to another subgrid in a spiral; [and] during the traveling in each subgrid:... determines which part of the subgrid map has a highest density of uncleaned cells; [and] using the map calculates a travel path to the part of the map that has the highest density of uncleaned cells. Applicants submit that the cited prior art references, taken alone or in combination, do not disclose or even suggest the present claimed invention.

In contrast, Hulden discloses an energy-efficient method for navigation of an autonomous cleaning apparatus. According to the disclosed method, the area is divided into cells, each of which is being indicated as cleaned, uncleaned or occupied by an obstacle. See page 12, lines 27-29. The navigation route to the uncleaned cell is determined using a predetermined energy cost function. See page 13, lines 6-8. The cleaning apparatus is then navigated to the uncleaned cell according to the navigation route. Preferably, the energy cost function depends both on the distance from the current cell to the uncleaned cell as well as the total change of direction required for moving thereto (i.e., a larger change of direction, a larger distance being given a larger cost). See page 13, lines 10-16. In other words, Hulden discloses that cells, cleaning of which requires the smallest amount of energy, are cleaned first, followed by the cells which require more energy.

This energy-based approach for determining travel path differs significantly from the technique recited in amended independent claims 1 and 12 in which the cleaning machine uses a map to determines which part of a map has a highest density of uncleaned cells and calculate a travel path to the part of the map that has the highest density of uncleaned cells. It also determines if the travel path is free from obstructions, and, if the path is obstructed, rotates the travel path by a predetermined number of degrees and recalculates the travel path. The claimed device does not rely on energy saving or other methods as disclosed in Hulden.

In addition, Hulden's cleaning apparatus does not generate subgrid maps of an area being cleaned, wherein the subgrid map has a higher resolution than the resolution of the internal map, as claimed herein. Hulden also does not disclose or even suggest that the cleaning apparatus travels from one subgrid to another subgrid in a spiral, as claimed herein. Accordingly, Hulden does not disclose the cleaner and method as claimed in amended independent claims 1 and 12.

The Aldred reference relates to and has a substantially similar specification and drawings as US Pub. 2005/0046373 also to Aldred, which was previously cited by the Examiner in the Office Action dated September 4, 2008 in the present application. Both Aldred references disclose an autonomous cleaning machine. When placed in a room and activated, the machine begins to navigate around the boundary of the room, continuously detecting the presence of the wall and maintaining the machine at a predetermined distance from the wall. See paragraph 0047 of US Pub. 2005/0046373. The machine continuously records information about the path that it takes in following the boundary of the room. See *Id.* The machine also plots the traveled path in order to construct a map of the working area. See paragraph 0049. Once the machine has established a good map of the working area, the machine then begins the task of cleaning the entire floor area. See paragraph 0069. The basic technique that the machine uses to cover a

floor area is a reciprocating scanning movement. See paragraph 0070 and FIG. 12. That is, from a start point, the machine follows a set of parallel straight line paths, each path being followed by a step across movement that positions the machine pointing back in the direction from which it has just come, but translated one brush bar width across in the direction of the scan. See paragraph 0070. When the machine reaches an obstruction, "it proceeds to follow the edge of the object, cleaning around the edge of the object." See paragraph 0087.

However, Aldred does not disclose or suggest that the map of the working area is divided into subgrids, with each subgrid having a subgrid map divided into cells, and that the cleaning machine determines which part of the subgrid map has uncleaned cells, as recited in amended independent claims 1 and 12 of the present invention. Aldred also does not disclose that a cleaning machine moves from one subgrid to another in spiral, as claimed herein. Aldred also fails to disclose that the cleaning machine uses the map to determine if the travel path is free from obstructions, and, if the travel path is obstructed, rotating the travel path by a predetermined number of degrees and recalculating the travel path, as claimed herein. In contrast, Aldred discloses that the cleaning machine covers the floor area in reciprocating scanning movements, by traveling in parallel straight line paths with each path being followed by a step across movement and cleaning around the edge of the various obstructions. See paragraphs 0070 and 0087. This approach differs significantly from the technique claimed in amended independent claims 1 and 12.

Kurtzberg discloses a method for optimizing an operation of a self-guided vehicle. The vehicle creates a map of the encompassing region and its target destination using various sensors. See col. 3, lines 5-7. The system then superimposes a cell grid on the map. The location of the vehicle is in a particular cell and the target is located in another cell. The vehicle moves from

cell to cell from its current location to its target location following a path of least resistance to its movement, as described below. See col. 3, lines 12-20. Specifically, the system constructs a weighted-edge graph from the cells. The nodes of this graph designate the cells and the connecting edges represent the linkages to adjacent cells that can be directly reached. See col. 3, lines 39-42. The root node of the graph is associated with the cell in which the vehicle is currently located. The task for the vehicle is to traverse from the root node to the target node i.e., the node representing the target cell, so as to minimize the sum of the weighted graph edges of the traversed nodes. See col. 3, lines 49-53. Computation of the minimum path tree establishes a connection from the root node to the target node. See col. 3, lines 66-67.

Although Kurtzberg discloses that the map is divided in subgrids, the reference does not disclose or suggest that the vehicle moves from one subgrid to another in spiral, as recited in amended independent claims 1 and 12. In stark contrast, the vehicle moves from its current location to its target location following a path of least resistance to its movement, as described above. Accordingly, Kurtzberg does not disclose all of the limitations of independent claims 1 and 12.

Okumura was not cited for nor does it cure the above-identified deficiencies of Hulden, Adler and Kurtzberg. For example, Okumura does not disclose or even suggest that a map of the working area is divided into subgrids which in turn divided into cells, with each subgrid having a subgrid map, and that a cleaning machine determines which part of the subgrid map has uncleaned cells, as recited in amended independent claims 1 and 12. Okumura also does not disclose that a cleaning machine moves from one subgrid to another in spiral, as claimed herein.

At least for these reasons, independent claims 1 and 12 and the claims dependent thereon are patentable over Hulden, Adler, Kurtzberg and Okumura, taken alone or in alleged

combination. Accordingly, withdrawal of the claim rejections under Section 103 is respectfully requested. Reconsideration is respectfully requested.

Conclusion

Accordingly, Applicants respectfully submit that claims 1, 3-12 and 14-22 are in condition for allowance and a Notice of Allowability is earnestly solicited. If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact the Applicants' undersigned counsel at the telephone number, indicated below, to arrange for an interview to expedite the disposition of this case.

Respectfully submitted,

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